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BRANCHES OF THE ACADEMY OF SCIENCES OF THE USSR

By Dr. P. KOLESNIKOV

VICE-CHAIRMAN OF THE COMMITTEE OF BRANCHES AND BASES OF THE ACADEMY OF SCIENCES OF THE USSR

IN the Soviet Union the Academy of Sciences has become the greatest scientific center of the country, embracing scores of institutes and hundreds of laboratories.

The time has long since passed when science and art were the domain only of the capital and of a few of the larger cities. To-day science is making swift progress and scientific personnel are quickly growing in the most distant national regions of the USSR.

The Academy of Sciences of the USSR comprises several republican branches and scientific bases. Article 48 of the Statutes of the Academy of Sciences reads:

Branches of the Academy of Sciences in the locality constitute incorporated research institutes, while the local bases of the Academy of Sciences represent complexes of research institutes, these branches and bases studying the natural wealth, the economy and the culture of the respective individual Republic, Territory and Region.

Branches and bases of the Academy of Sciences of the USSR are located all over the country—from the Kola Peninsula to the foothills of the Pamir Mountains. There are also the following major scientific centers—the Academy of Sciences of the Georgian SSR, those of the Ukrainian SSR and the Byelorussian SSR and the USSR Academy branches in the Azerbaijan and the Uzbek Republics.

Branches of the Academy of Sciences of the USSR are also established in Armenia, Kazakhstan, Tajikistan and in the Urals. Then there is the Kola Base in the Trans-Polar regions, and the Northern Base—in Archangel.

Each of these branches embraces a group of scientific institutes, laboratories, stations, preserves and other institutions engaging in research.

Altogether the Academy of Sciences has eight local branches and two bases, comprising 29 institutes and 105 laboratories, stations, observatories, botanical gardens and other scientific establishments.

About 3,000 scientific and scientific-technical workers are engaged in these branches and bases, including 15 academicians, 5 corresponding members of the academy, over 400 doctors and masters of science and 300 postgraduate students.

A numerable native personnel of scientific workers has been established in the national republics where academy branches are located. In the Armenian Branch, for instance, 93 per cent. of the scientific workers are Armenians by birth, 73 per cent. of the workers in the Georgian Branch are native Georgians, etc.

The volume of printed publications serves as an indication of the growth of academy branches and bases; publications exceeding 5,000 printer's signatures—such is the total volume of titles put out by the branches and bases in the past few years. In 1940 alone the Georgian Academy of Sciences prepared for press and published various scientific works totaling about 1,000 printer's signatures; in that same year the Azerbaijan Branch published 610 signatures, the Armenian Branch 530 signatures, etc.

Practically all the academy branches have their own printing facilities, allowing scientific works to be published not only in the corresponding national language but also in Russian. The Azerbaijan and Uzbek branches publish scientific and popular-scientific periodicals in the respective languages.

In recent years the scientific institutions of the academy branches and bases have accomplished a large program of work closely bound up with the national economy and the cultural progress of the national republics. In 1940 alone 168 various scientific works (on geology, metallurgy, chemistry, agriculture, etc.) were introduced into the national economy.

Various organizations and enterprises enjoy the systematic consultation of the Academy of Sciences branches.

In conformity with the tasks posited by the Soviet government—that of strengthening the raw material base of separate districts—the academy branches have widely developed the prospecting of minerals and the study of the geography of these districts.

On the basis of scientific explorations (Professor Chernov) the Northern Base of the Academy of Sciences established that salt deposits are located near Kotlas, in the north, and coal at the Cheshskaya Bay. The subsequent prospecting by geological parties fully confirmed this forecast and the North is now faced with the practical problems of working its own salt for the White Sea and Murmansk fisheries and of mining local coal for the swiftly developing industries of the Trans-Polar regions.

The discovery of niobium ore deposits, made by a group of prospectors, has brought up the question of establishing a Soviet niobium industry.

The discovery of selenium and other, richer compounds of rare earths on the Kola Peninsula has placed new tasks before the non-ferrous and rare metals industry of the USSR.

The Georgian Academy of Sciences is successfully employing new geophysical methods in prospecting the copper deposits in Svanetia.

The Armenian Branch of the USSR Academy of Sciences has furnished the first precise data concerning the local aluminium ores, constituting a local raw material base for the aluminium industry of Soviet Armenia.

The Tajik Branch has finished working up materials on the mineral resources of the Tajik SSR and has indicated the vast reserves of superior narzan mineral waters on the territory of this republic. Another important discovery made by the scientific workers of the Tajik Branch was that of the deposits of iron ores (magnetites and hematites) in Ramitsi District and the determination of the geological reserves in the explored part of these deposits.

Professor Abramovich, of the Azerbaijan Branch, has collected material substantiating the assumption of distribution of petroleum in strata, the direction of flow of oil to the well and the approximate determination of the change in the properties of petroleum when worked.

Expeditions of the Azerbaijan Branch have amassed considerable material on the geology, tectonics, petrography and mineralogy of the barite deposits in the Chavdar and other areas of the basin of the River Ter-ter. In 1940, on the basis of these data furnished by the expeditions, the Azerbaijan Geological Board conducted wide-scale and detailed prospecting of barites.

Gabrielyan, a scientific collaborator of the Uzbek Branch, has evolved a method for combating sand jamming during the exploitation of oil wells.

Another equally important work—that of Krylov, also collaborating in the Uzbek Branch—gives new

foundations proving the presence of fresh water in the Golodny desert steppes, occurring at great depths in the crushed rocks and relating to the ancient beds of the Cherchik and Angren rivers. These conclusions are of major practical purport in projecting meliorative measures. The engineering-and-geological characteristics of the area of the stretch of the Northern Ferghana Canal—worked out by Krylov—and his estimations of the ground of different sections of this area which are destined to serve as the construction site for hydro-engineering structures, have been handed over for utilization to the corresponding People's Commissariat.

The scientific workers of the Armenian Branch have made a geological study of the Akverian marble deposits which are to-day being extensively quarried to supply material for the construction of the Palace of Soviets, the Moscow Metro Railway, etc. Several new marble deposits have been located, and the Armenian Marble Trust has been entrusted with making a detailed prospecting survey of them.

An expedition equipped by the Kazakh Branch of the USSR Academy of Sciences has discovered considerable quantities of tin at the Pavdin deposits, which had been hitherto known only for their deposits of copper. This expedition likewise established the presence of bismuth in the polymetallic ores of the Akchibal deposits, in Central Kazakhstan. This substantially extends the area of occurrence of tin in the Kizyl-Este ore deposits.

The Urals Branch has brought its study of the suitability of Ural dunites to serve as fireclays to the stage of commercial utility in industry. This branch has also worked out methods for obtaining naturally alloyed metals by means of usual blast furnace smelting of the ore and has proved the possibility of obtaining niobium pig-iron by blast furnace process. This academy branch has likewise established the agglomerative properties of loparite concentrates, thus making it feasible to widely utilize the niobium ores for the production of special steels.

The possibilities of utilizing the waste products after concentration of the Kusin titano-magnetites have likewise been proved feasible. This will reduce the cost of agglomerates produced by the plant.

The Urals Branch has also designed and constructed several types of precision instruments of much importance for industry. These appliances include a transportable kiloamper meter for a comparatively rough gauging of the strength of current, which is necessary in regulating electrolytic baths, a kilowatt-hour meter in which the electric current coil is replaced by a metal strip; besides this, improvements have been introduced in the magnet-wire of transformers. A rational system as well as methods and the requisite appliances have been designed for the factory control of the magnetic properties of transformer steels and the application of these devices in one of the Urals works resulted in a marked improvement in the quality of these steels. Finally, an improved method of magnetic defectoscopy has been worked out for testing track rails and parts of powerful, high-speed machines.

These undertakings allow the positing and solution of problems which could not have been solved before, when technology, chemistry and geology stood separated from each other. And it is this joint work of different specialists which forms one of the salient features of the local undertakings of the academy branches.

In this respect mention should be made of the work done in relation to petroleum. Oil, which abounds in the Apsheron Peninsula, particularly attracts the attention of geologists, physicists and chemists. Workers of the physics department of the Azerbaijan Academy have made an electric model of an oil stratus. By means of data characterizing the hydraulic permeability of the layer in separate points, this model makes it possible to judge of the distribution of oil throughout the whole stratum. This in turn enables the oil workers to sink the well in the most efficient manner, ensuring the maximum yield of petroleum. This method of electric modelling of oil strata—which has passed laboratory tests—is to be employed in the Azerbaijan oil fields.

Another interesting method worked out by the collaborators of the Azerbaijan Branch allows the hydraulic permeability of porous rocks drawn out of the well hole to be quickly measured—in ten minutes. This method will be of great utility not only in geology but also in hydro-engineering, metallurgy, soil study, chemistry, etc.

The vast construction now proceeding throughout the Soviet Union requires a tremendous volume of building materials. Some of the academy branch institutes, in particular the Chemical Institute of the Uzbek Branch, have placed before themselves the task of cement production out of locally available raw material. This undertaking is finding successful solution in Central Asia, Professor Kancepolsky being in charge of this work here.

The investigations of the Chemical Institute of the Uzbek Branch have shown that the loess of the Khimkov deposits, containing 35 per cent. calcium carbonate, after processing, possesses particularly high binding properties and stability, exceeding that of the standard grades and requiring less fuel in manufacture.

Considerable works have been accomplished by the academy branches in the domain of biological sciences

—geobotanical studies of individual territories (the Kazakh Branch and the Kola Base), extending the pasture acreage and raising its productivity, measures aimed against salinification of the soil, work on increasing fodder resources, etc.

A number of botanical gardens, the high-mountain soil-and-botanical station on the Pamir Mountains and the Polar botanical gardens in Kirov study the local flora, raise various species of decorative plants and have introduced the cultivation of several wild-growing plants.

(To be Concluded)

IMAGINARY SUBMARINE CANYONS[1]

By Dr. FRANCIS P. SHEPARD

DIVISION OF WAR RESEARCH, UNIVERSITY OF CALIFORNIA, SAN DIEGO, CALIF.

THE VEATCH-SMITH SUBMARINE CONTOURS

FOR some years the discovery of the great submarine canyons along the oceanic slopes off the east coast filled many of the outstanding geological theorists with misgivings. They were less disturbed by the deeply submerged canyons with the characteristics of river valleys off California, since this coast was well known to be unstable, but river canyons off the supposedly stable east coast were unthinkable; and to make matters worse, charts were showing that submarine canyons were practically universal. Assuredly the continents of the world could not all have been moving up and down many thousands of feet during the late part of geological time. Into the breech at the critical moment stepped a series of maps of outstanding workmanship which appear to have taken at least the eastern part of the country by storm. These maps were the result of painstaking contouring by A. C. Veatch and by his collaborator, Paul Smith.[2] The contours, as both Veatch and Smith have frankly admitted, are based on the hypothesis that the submarine slopes have a stream-cut type of topography. Accordingly, the contours show a great mass of gullies and valleys even out at the greatest depths where there are few soundings. These small valleys shown on the maps have been seized on eagerly without any apparent attempt to determine their basis and are now established as the pièce de resistance of three new hypotheses advocating submarine origin of the canyons. Two of these have appeared in books[3] and a third as a short article.[4] The maps have also been reproduced in many textbooks and have been the source from which a model reposing in the American Museum of Natural History was drawn. Even *Life* magazine recently reproduced a picture of this model with mention in garbled form of one of the new hypotheses.

Since the tendency of late has been to regard these gullies as the typical submarine valleys and accordingly to disregard the great rock-walled canyons which have been revealed by years of scientific exploration of the sea floor, it might be well to give the scientific public some insight on the basis of these supposed gullies and their relation to the problem of the history of the ocean floors. Regarding these contours one must admit in all fairness that they represent long painstaking effort. Certainly it would have been difficult to fit stream-dissected slope topography more perfectly into the soundings than has been done. On the other hand, the contouring could have been executed with the same care in attempting to show what actually existed out on these submarine slopes off the east coast. That this was not done is indicated by the fact that the same soundings were contoured by a series of six topographers and geologists of the U. S. Geological Survey and by the present writer and his co-worker, K. O. Emery, and in no case did these closely spaced small valleys appear in the contoured maps which resulted. Instead of these myriads of gullies a series of relatively large canyons (shown also by Veatch and Smith) are revealed on the slopes. The canyons are of the type which recent theories have so meticulously avoided. In a forthcoming paper, Emery and the writer will present in some detail the abundant evidence which is thought to reject the gully hypothesis of contour interpretation of these soundings off the east coast. It may be sufficient to state here that any one who has a conviction of the existence of these gullies need only return to the original data and attempt to contour some portion of the deep outer slopes bearing in mind that unavoidable errors of observation increase with depth.

A SUBMARINE ORIGIN OF THE CANYONS

The recent hypotheses which attempt to explain submarine canyons as formed without emergence include

[1] Contributions from the Scripps Institution of Oceanography, New Series, No. 214.

[2] Special Paper 7, Geological Society of America, 1939.

[3] D. W. Johnson, "The Origin of Submarine Canyons," Columbia University Press, 1939; R. A. Daly, "The Floor of the Ocean," Univ. of North Carolina Press, 1942.

[4] W. H. Bucher, *Bull. Geol. Soc. Amer.*, Vol. 51, pp. 489–512.

in order of their appearance: R. A. Daly's muddy density currents, D. W. Johnson's artesian springs, and W. H. Bucher's tsunamic sea waves (also called tidal waves or seismic sea waves). In defending these hypotheses the advantage of the gully concept provided by the Veatch-Smith maps is very evident, since none of these processes could account for huge canyons. All these authors have referred to canyons like those off the California coast as a different phenomenon from the submarine valleys which they are trying to explain. They all imply that submarine valleys in general are of the nature of the Veatch-Smith gullies.

Daly's idea that muddy currents moved down the ocean slopes during glacial stages might conceivably be used to explain small gullies cut into a muddy slope, but even for this explanation Daly had to draw on the now discredited idea that the outer continental shelves are or were great mud banks. Bucher's tsunamis (tidal waves) must set up occasional strong currents on the ocean floor, but it would be amazing if these rare manifestations could have cut more than small valleys into the ocean slopes. Furthermore, the distribution of submarine canyons shows no relationship to the areas where these waves occur. Also the waves are of a nature which should produce erosion on projections rather than in valley-like indentations. Johnson's artesian springs require high land along the coast with water-bearing layers dipping seaward and extending under the shelf and outcropping on the outer slopes. Even under these ideal and rare conditions, excavations on the slope by the artesian springs could produce only small valleys, which should have many basin depressions along their length. Even the fanciful Veatch-Smith contours show nothing of this sort. For further objections to these hypotheses the reader may refer either to the Johnson or Daly book which are most successful in discounting the other's hypothesis or to the writer's discussion of the subject in which an attempt was made to give facts favorable and unfavorable to each hypothesis.[5]

Leaving Hamlet out of the Play

If all this attempt to explain submarine valleys is dealing with a purely fictitious concept, the situation would appear to approach the ridiculous. Are the typical submarine valleys of the world of the order of these hypothetical east coast gullies or are they comparable to the well-known California rock-walled canyons? All the available evidence suggests that the latter is the case. The Coast and Geodetic Survey charts provide abundant evidence of the existence of canyons thousands of feet deep and extending many miles into the outer edge of the continental shelf. H. C. Stetson's well-known investigations have shown that many of the sea canyons have rocky walls. Most of the information regarding other submarine valleys comes from the charts of the world. All available charts have been studied by the writer and the soundings indicate clearly that the great majority of the known submarine valleys are large canyons, that is, canyons comparable in dimensions with those which cut great mountain walls. Furthermore, the bottom notations reveal that rock is present on the canyon sides in numerous places. These statements may be easily verified by examination of the charts from the various coasts of the world.

Is it reasonable to present a hypothesis which disregards such great submarine canyons as the huge Hudson Canyon which can be traced for miles off New York, the canyon off the Congo, which is a hundred and twenty miles long and extends 18 miles into the coast in the Congo estuary, the huge Fosse de Cap Breton off southwestern France, the equally large Canal de Nazare off the Portuguese coast which appears to be cut in granite, the canyon off the Indus which crosses a 60-mile shelf off the Indus River or the rock-walled canyons off Ceylon, to mention a few all off relatively stable coasts? If we consider all these great canyons as well as all the canyons off unstable coasts as exceptional, just what will we have left? We are not only excluding Hamlet from the stage, but all the other actors.

River Erosion

Despite the enthusiastic abandonment of the river erosion hypothesis by these recent writers the facts continue to favor the idea. All the detailed surveys of the submarine canyons have revealed distinctly river valley characteristics.[6] Characteristically these canyons the world over are V-shaped, steep rock-walled, winding valleys with branching tributaries. A very large per cent. are located off river mouths and some of them are obviously submarine continuations of land canyons. The explored canyons off California contain numerous rounded pebbles even at depths as great as one mile below sea level. Many other observations indicate the submergence of the land margins. The case may not be rigidly established, but it is substantial and should not be thrown aside just because it presents a difficulty in the path of certain preconceived hypotheses. It is to be hoped that if there are future suggestions of causes of submarine canyons, they will be evolved after a careful study of the facts or preferably after field investigation of the canyons.

[5] Special Paper No. 31, Geological Society of America, 1941.

[6] Charts of many are available in Special Paper 31, Geological Society of America.

OBITUARY

ALBRO D. MORRILL
1854–1943

ALBRO D. MORRILL, emeritus professor of biology in Hamilton College, died on June 8, 1943, following an attack of apoplexy. He was born in Northfield, N. H., on August 29, 1854. As a boy, he spent much time working in his father's nursery. It was here, while budding fruit trees, that he first became interested in biology.

Professor Morrill received his bachelor of science degree from Dartmouth College in 1876 and his master of science degree from Dartmouth three years later. Belmont College gave him an honorary master of arts degree in 1886, and in 1926 he was honored with a doctor of science degree by Colgate University.

He began his teaching career in 1878 as science teacher in an academy at Lewiston, Pa. In 1883 he accepted a professorship at Belmont College and in 1888 he went to Ohio University as professor of geology and biology. He came to Hamilton College in 1892 as professor of chemistry and biology, but from 1896 until his retirement in 1928 he devoted himself to biology.

Professor Morrill's greatest professional achievement was the creation and development of the biology department at Hamilton. During the early days of his professorship at Hamilton emphasis was on classical study, yet in his quiet, independent and creative way he got a department of biology going. His first laboratory was in an old dormitory where there was not even running water. Yet, on his retirement in 1928, after thirty-seven years on the Hamilton College faculty, he turned over to his successors one of the best college biological laboratories in the country, an unusually good natural history museum and an excellent library.

At the time of his retirement the hundreds of students who had majored in biology under his instruction established a fund in the interest of an A. D. Morrill Biological Library to which Professor Morrill added his personal collection.

Professor Morrill always retained one characteristic of his New England ancestry: he was sparing in his use of words, yet he was a gifted teacher. He stimulated students to find out things for themselves. In spite of his reserved manner he acquired the true affection of his students, and one of his greatest satisfactions was the feeling that he had contributed to the world of science through the successes of the men who had been students of his during their college years.

He was one of the pioneer research workers in the Marine Biological Laboratory at Woods Hole, Mass., and at the laboratories of the U. S. Bureau of Fisheries at Beaufort, N. C. At the age of fifty, under advice from his physician, he broke with the habit of years, that of spending nine months in his college laboratory and then three at Woods Hole. In the summer of 1904 he accepted the opportunity to join a picked group to be trained by the Bureau of University Travel as leaders of future parties of European travelers. For the next ten years he spent his summers in this work.

Professor Morrill was a fellow of the American Association for the Advancement of Science and a member of the American Society of Naturalists, the American Society of Zoologists, the Boston Society of Natural History and the College Faculty Club. He was associated with the Presbyterian church of Clinton, where he taught a Sunday-school class for many years.

On December 23, 1879, he married Miss Lena E. Carver, of Binghamton, N. Y., who died in 1934. His sister, Catharine Morrill, who has made her home with him, survives.

WALTER N. HESS

ELIZABETH TOWAR PLATT

ELIZABETH TOWAR PLATT, librarian of the American Geographical Society, bibliographer, informed geographical student, respected editor, died in New York City on May 22 in her forty-fourth year. Although her professional life was comparatively brief, her contributions to geography were many and, fortunately, of an enduring character.

Elizabeth Platt was born on February 25, 1900, into a family prominent in the anthracite coal industry in Hazleton, Pennsylvania. Trained as a librarian at Columbia University, her appointment to the staff of the American Geographical Society in 1920 gave definition to her career. Early sensing the importance of securing a broad geographical background, she supplemented her formal library training with studies in geology and geography at Columbia, leading to the bachelor's degree in 1930 and the master's degree two years later. Thus a fortunate combination of native abilities and training, strengthened by practical experience, bore fruit in the adaptation of library methods to the requirements of geographical research. Advanced to the position of assistant librarian in 1925, Miss Platt gradually assumed administrative charge, under the general direction of Dr. John K. Wright, and became largely responsible for book selections and cataloguing. Her promotion in 1937 to the position of librarian was a fitting sequel to these events.

The expansion of the society's library from 80,000 volumes in 1925 to nearly 120,000 in the present year provides an impressive measure of Miss Platt's mounting responsibilities. More than this, the collections were carefully listed and organized into the cognate fields provided for in the Research Catalogue, which was established in 1923 and improved and extended under Miss Platt's direction. Consultants seeking aid beyond that offered by the Research Catalogue would find Miss Platt a ready and reliable source of suggestion and advice. Her ability in assembling materials on the comprehensive problems often confronting geographical investigators is well remembered by the many, from this country and abroad, who have studied in the society's library. Warm acknowledgments to the librarian's unstinted aid appear in the prefaces and footnotes of numerous volumes.

During the past decade, Miss Platt's services to research workers extended far beyond the confines of the library. *Current Geographical Publications,* issued monthly except during the summer, was launched in 1938 entirely as a result of her enterprise and industry. True to its title, this bibliography lists significant literature—the word is used in the broad sense—under the categories of the Research Catalogue. Valued by investigators in geography and allied fields, *Current Geographical Publications* is now the only publication of its kind in existence. In addition, Miss Platt prepared the society's annual contributions to *Bibliographie Géographique Internationale* from 1923 to its suspension of publication after 1938. The material included in the *Bibliographie* embraced all geographical works published in the United States, covering the field of geography as a whole, and the geography of Latin America, and its preparation involved a large amount of collation and editing during two or three months each year. Only a small group of colleagues knew of Miss Platt's contributions to the distinguished French bibliography; fewer still are aware that many unsigned notes and reviews in the *Geographical Review* and the *Handbook of Latin American Studies* were likewise hers. She was a member of the advisory group which helped found *Social Science Abstracts,* and was a regular contributor to the *American Year Book.* She also founded and assembled an extensive photographic collection.

In keeping with Elizabeth Platt's interests and skills were two other tasks of a high order—one unfinished, the other completed just before her death. Since about the year 1930, she had been systematically accumulating references to geographical and cartographic bibliographies, an extensive compilation which was to have been used this summer, in collaboration with Dr. Wright, in preparing a new edition of "Aids to Geographical Research," originally issued by the society in 1923. It is encouraging to learn that this revision will be carried through by its senior author and that, in its new and enlarged form, an additional monument to Miss Platt's work will be available. During the closing year of her life, Miss Platt edited "Mirror for Americans: Likeness of the Eastern Seaboard, 1810," forming Special Publication 27 of the society. This volume, involving the use of sources to a new purpose, presented an editorial challenge to one versed, as was Miss Platt, in the handling and interpretation of geographical and near-geographical literature. The editorial work was performed with enthusiasm and devotion to the difficult task at hand. The memorialist, who is also the author of the book, may be permitted to record that Miss Platt prepared the citations in the bibliography and that a large proportion of the notes, occupying nearly forty closely printed pages, received the benefit of her expert knowledge. The format, typography and many of the illustrations were suggested by her, and throughout are numerous evidences of her good taste and discrimination and of her love of books. It is a matter of deep regret that, so closely did Miss Platt's death follow the appearance of the printed volume, she was unable to see the results.

Miss Platt was a member of many societies representing the two fields of her chief intellectual interests, bibliography and geography, and enjoyed the distinction of being a representative to the Division of Geology and Geography of the National Research Council. She was a member of the American Library Association, the Special Libraries Association, the Bibliographical Society of America, the New York Library Club; and at one time served as treasurer of the New York Group of the Society of Woman Geographers. She was elected this year to the Association of American Geographers one of whose members, upon learning of her unexpected death, framed the combined sentiment in saying, "We could not afford to lose her."

RALPH H. BROWN

UNIVERSITY OF MINNESOTA

RECENT DEATHS

DR. FREDERICK J. TAUSSIG, professor of clinical obstetrics at Washington University Medical School, St. Louis, died on August 21 in his seventy-first year.

PHILIP N. MOULTHROP, assistant in charge of mammalogy at the Cleveland Museum of Natural History, died on August 21 at the age of thirty-one years.

SCIENTIFIC EVENTS

THE NATIONAL ACADEMY OF PEIPING

A REPORT of the National Academy of Peiping covering the years 1937–42 has been issued by the Kunming Office of the academy and is summarized in *Nature*. On the outbreak of the present war with Japan, Peiping was immediately taken over by the invader, and the academy, which at its foundation in 1929 consisted of nine separate research institutes with a staff of more than two hundred, succeeded in transferring part of the books and equipment of each of its institutes to the south; within a few months most of its work was resumed at Kunming, Yunnan, with a staff now consisting of 120 members. In addition to Chinese Government grants amounting to $620,000, grants are received from the Sino-American, Sino-British and Sino-French Foundation Funds. The Institute of Physics has been increasingly concerned with problems of industry and national defense. A laboratory for spectroscopy has been established to meet the needs of the new metallurgical industry, and the institute has also standardized more than a thousand radio transmitters with its own quartz oscillators. Its other efforts have been confined mainly to the development of applied optics and geophysical prospecting. The Institute of Radium consists of laboratories for chemistry and radioactivity, in which many Chinese minerals have been examined, and for x-rays, where the work has been mainly on crystal analysis and x-ray studies of alloys of tungsten and antimony.

In the Institute of Chemistry, work has been carried out on the extraction of dyes from local plants and their application to textiles, the preparation and small-scale manufacture of medicinals from local raw materials, the recovery of used engine oils, replacement of Diesel oil by vegetable oil and preparation of a substitute for petrol from molasses and sawdust, analysis of water supplies and extraction of potash from different types of ashes. The Institute of Materia Medica has concentrated on investigations of Chinese drugs, such as Chinese ephedra. The active principles have been isolated, and their properties and pharmacological action studied. Some materials, such as ephedrin and vitamin B_1, have been prepared on a commercial scale for clinical use. The Institute of Physiology has extended its investigations on the physiological effects of various Chinese drugs to investigations on the nutrition values of the foodstuffs used by inhabitants of the southwest of China, and the treatment of chicken cholera with sulfanilamide. The Institute of Zoology, besides work on the fauna of Yunnan, has made systematic studies of the principal fresh-water fauna of Yunnan, particularly the fishes of the inland lakes, their diseases and enemies. The Institute of Botany has commenced investigations on economic botany, in addition to those on agriculture and forestry already in progress, and a special survey of the plant life of northwest China has been planned and organized. The Institute of Geology is mainly occupied with the detailed mapping of mineral deposits.

THE UNIVERSITY OF LONDON

THE report of the acting principal of the University of London, Harold Claughton, on the work of the University of London during the year 1942–3, according to *The British Medical Journal*, mentions that several schools have decided that, provided certain essential repairs to their London buildings can be undertaken, they should return to London. Among these are King's College, which hopes to bring its remaining faculties back from Bristol, following the return, which has already taken place, of the medical students from Birmingham; the London School of Medicine for Women, which is bringing its preclinical students back from Exeter; the London Hospital Medical College, whose preclinical students are returning from Cambridge; the Middlesex Hospital Medical School, whose preclinical students have returned from Leeds; and the whole Medical School of University College Hospital, because the sector hospital in which teaching has so far been conducted is now put to other uses. Certain schools have suffered such heavy war damage that it is most unlikely that they will be able to return until after the war; among these is St. Bartholomew's Hospital Medical College.

The section of the report on teaching and research says that in the case of medicine, to meet the urgent demand for doctors for the armed forces, the time required to be spent on the full medical course (but not the course itself) has been shortened and additional examinations have been held.

At the London Hospital Medical College Professor A. W. M. Ellis has resigned from the chair of medicine on his appointment as Regius professor of medicine at the University of Oxford. At the Middlesex Hospital Medical School Dr. B. W. Windeyer has been appointed as the first occupant of the chair of radiology, which, though instituted in 1920, had never been filled. At University College Hospital Medical School Professor C. R. Harington has resigned from the chair of chemical pathology and his post as director of the Graham Research Laboratories on being appointed director of the National Institute of Medical Research. At the Royal Cancer Hospital Dr. G. A. R. Kon has been appointed to the chair of chemistry.

THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS AND THE KILGORE BILL

THE Executive Committee of the American Association of Cereal Chemists has unanimously endorsed the following resolution:

WHEREAS, it appears that enactment of the Kilgore-Patman Bill S-702 HR 2100 for the establishment of an Office of Scientific and Technical Mobilization would confuse the war effort and might develop in peace time into a bureaucracy that would impede scientific and technical progress and

WHEREAS, the Executive Committee of the American Association of Cereal Chemists after careful consideration of the cooperation now existing among scientific men in the cereal industries in their joint efforts to aid in the prosecution of the war and with due regard for the possible disturbing effect on this legislation upon the war effort and future technical progress of the nation, therefore be it

Resolved, that this committee representing an association which includes in its membership chemists from most of the cereal laboratories of the United States express its general opposition to this proposed legislation and be it further

Resolved, that all cereal chemists be urged to communicate their objections to this proposal to their Congressmen.

VISUAL INSTRUCTION IN MICROBIOLOGY

ABOUT a year ago the Society of American Bacteriologists appointed a Committee on Materials for Visual Instruction in Microbiology, under the chairmanship of Dr. Harry E. Morton, of the School of Medicine of the University of Pennsylvania, to investigate materials on bacteria, rickettsiae, viruses, fungi and animal parasites (SCIENCE, Vol. 96, No. 2494, Suppl. p. 12). It was believed that such materials would be very helpful in the wartime teaching of these subjects. The committee has concerned itself during the first year with the investigation of motion picture films on these subjects. About 80 films have been reviewed. Anybody interested may obtain a list of the titles of the films which have been reviewed. Individuals may obtain abstracts of any films on the list in which they are interested. The abstracts give such pertinent information as date of production of the film, author, producer, type of film, *i.e.*, 16 or 35 mm, silent or sound, colored or black and white, length, name and address of the distributor and under what conditions the films are obtainable. Many of the films are available from various distributors by paying the transportation charges, other films are available by paying a small rental fee. In addition the abstract contains a résumé of the subject content of the film which is helpful to the user of the film and to students. Because of the large demand for the abstracts the work of the committee had to be made self-sufficient. A policy has been instituted of charging three cents per abstract, with a minimum charge of ten cents, and a special price for quantities of a given abstract when used for teaching purposes.

THE PITTSBURGH MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE 1943 fall meeting of the American Chemical Society will be held at Pittsburgh from September 6 to 10 under the presidency of Dr. Per K. Frolich. There will be no plant trips and no organized entertainment. All the time will be available for technical sessions, conferences and group discussions. There will, however, according to the official announcement, be special symposia, round tables and scientific papers planned to be helpful to chemists and chemical engineers in their war activities. Committees of many war agencies will hold meetings. The Employment Clearing House will aid employers needing chemists and chemical engineers and those men and women who are not at present using their talents to the full.

A number of symposia has been arranged on the following subjects:

The Stephen M. Babcock Memorial Symposium, Ellery H. Harvey, presiding. Thursday morning, September 9.

Technical Library Techniques, Norman C. Hill, presiding. Tuesday morning and afternoon, September 7.

The Research Tools of the Colloid Chemist, W. O. Milligan, presiding. Thursday morning and afternoon, September 9, and Friday morning and afternoon, September 10.

Boron in Agriculture, H. B. Siems, presiding. Monday morning and afternoon, September 6.

Research Management, Francis J. Curtis, presiding. Monday morning and afternoon, September 6.

Molecular Addition Compounds, W. Conard Fernelius, presiding. Monday morning and afternoon, September 6.

Reactions of Solids, Roland Ward, presiding. Tuesday morning, September 7.

Industrial Hygiene, L. F. Warrick, presiding. Monday morning and afternoon, September 6.

Manpower Problems in the Chemical Industry, Albert L. Elder, presiding. Tuesday morning and afternoon, September 7.

Lactic Acid and Its Derived Products, Lee T. Smith, presiding. Thursday morning, September 9.

A number of general papers will be read before the sections of the various divisions. In addition there will be groups of papers on special subjects. These include vitamins, proteins, nutrition, enzymes, hormones, metabolism, paints and varnish, plastics, kinetics and sugar. On Friday morning and afternoon there will be a round-table discussion on pilot-plant design construction and operation presided over by R. E. Burk.

The Pittsburgh section has arranged for an informal "get-together" on Monday evening, September 6. The presidential address of Dr. Frolich will be delivered on Wednesday afternoon. His address is entitled "Petroleum—Past, Present and Future." Colonel Bradley Dewey, of the Office of the Rubber Director, will speak on "The Synthetic Rubber Program—Present and Future"; Colonel Paul P. Logan, Quartermaster Corps, on "Army Food." A subscription dinner will be given at 7:30 in the evening.

On Wednesday, September 8, in the ballroom of the Hotel William Penn, there will be a continuous showing of industrial motion picture films from 9:30 to 11:30 A.M.

The Alien Property Custodian of the United States Government will exhibit some 10,000 copies of vested United States chemical patents and chemical patent applications. Formerly enemy-owned or enemy-controlled, these patents and patent applications are now under the control of the Alien Property Custodian. All, except those exclusively licensed to American firms, are available for use on liberal terms. The Fisher Scientific Company has arranged for an exhibit of its collection of about one hundred and fifty chemical and historical pictures.

AWARDS OF SIGMA XI GRANTS-IN-AID OF RESEARCH

THE following awards have been made in 1943 by the Society of the Sigma Xi:

R. H. Alden, of the University of Tennessee Medical School:
$200 for the purchase of equipment to aid in studies on the implantation of a mammalian egg.

T. T. Chen, of the University of California:
$290 to defray partial cost of special optical equipment for a microscope to aid in studies on the nuclei of malaria parasites.

E. E. Dale, of Union College:
$200 for technical assistance in connection with the study of the genetics and histology of petunia.

E. S. Deevey, Jr., of the Woods Hole Oceanographic Institute:
$150 to be used in the construction of a Wilson borer for studies on the developmental history of lakes.

R. R. Humphrey, of the University of Buffalo:
$150 to provide for part-time assistance in connection with studies on the genetics of sex determination in Amblystoma.

A. T. Miller, Jr., of the Medical School of the University of North Carolina:
$250 for assistance in the purchase of a pump and motor for the operation of a low pressure chamber.

E. H. Myers, of Stanford University:
$350 to be used in the purchase of equipment to aid in a study of the biology of tropical Foraminifera.

C. A. Neuberg, of New York University:
$250 for use in defraying cost of special chemicals and apparatus in connection with investigations on fermentation.

H. H. Nininger, of the American Meteorite Laboratory:
$250 for assistance in the publication of the results on the relation between meteorites and geology.

R. A. Studhalter and W. S. Glock, of the Texas Technological College, Lubbock:
$150 for technical assistance in the continuation of studies on tree rings.

The committee that made the awards consisted of Dr. Harlow Shapley, of the Harvard College Observatory, president of the society; Dr. Hugh S. Taylor, of Princeton University, and Dr. L. C. Dunn, of Columbia University.

SCIENTIFIC NOTES AND NEWS

THE Award of $1,000 in Pure Chemistry of the American Chemical Society, initiated by the late A. C. Langmuir and now provided for by Alpha Chi Sigma, has been awarded for the year 1943 to Kenneth Sanborn Pitzer, of the department of chemistry of the University of California. The prize will be presented to Dr. Pitzer at the annual meeting of the society, which will be held in Pittsburgh from September 6 to 10.

Chemical and Engineering News states that Ronald Q. Smith, chairman of the Hawaiian Section of the American Chemical Society, has been awarded the Legion of Merit by the Commanding General of the Hawaiian Department in recognition of his work in designing and manufacturing emergency gas masks and modified standard masks for small children. The presentation was made at a ceremony on June 24. Major Smith is on leave as an officer of the Pacific Guano and Fertilizer Company, while on active duty with the Chemical Warfare Service.

DR. SAMUEL ADAMS TRUFANT, III, has been presented with the Walter Reed Memorial Award for his thesis entitled "Sylvatic Plague." The award is given by Tulane University to a senior student at the School of Medicine.

NEWLY elected officers of the National Association of Science Writers are: *President,* Robert D. Potter, science editor of *The American Weekly;* and *Secretary-Treasurer,* Captain McDonough, AUS, Office of the Surgeon General of the Army. Committee appointments include Howard Blakeslee, the Associated Press, chairman of the President's Advisory Committee; William Laurence, *The New York Times,* chair-

man of the War Advisory Committee; Gobind B. Lal, International News Service, chairman of the Program Committee. A special publication committee has been appointed to explore the possibilities of founding an official journal of the association—a magazine designed to bring the advances of science and medicine to a wide layman audience. Serving on the committee with Potter, Laurence and Blakeslee are Waldemar Kaempffert, *The New York Times;* David Dietz, Scripps-Howard Newspapers, and Laurence Salter, the American Medical Association.

DR. WILLIAM WORTH HALE, since 1918 associate professor of pharmacology and assistant dean of the faculty of medicine of Harvard University, retired on August 31. He will continue as assistant dean of the faculty of medicine and chairman of the committee on admissions.

MALCOLM E. CAMPBELL, research manager of the Textile Research Institute, formerly senior cotton technologist of the U. S. Department of Agriculture, has been elected dean of the textile school at North Carolina State College, succeeding Dean Thomas Nelson, who has retired.

DR. HAROLD B. HITCHCOCK has joined the faculty of Middlebury College as assistant professor of biology. He succeeds Dr. Samuel E. Longwell, who retired in May after serving for twenty-four years. Dr. Rex N. Webster has been made chairman of the department. Other appointments include Dr. Charles D. Starr, assistant professor of physical chemistry, and Grant H. Harnest, instructor in biochemistry. John A. MacMorris, since 1934 head of the science department of the Corinth (N. Y.) schools, has been appointed instructor in physics.

J. OSBORN FULLER, instructor in geology at the Ohio State University, has become assistant professor of geology at the University of Virginia.

DR. A. W. HURD, dean of Hamline University, has been appointed director of educational research and service at the Medical College of Virginia.

THE *Journal* of the American Medical Association states that the Schenley Distillers Corporation through its president, Louis Rosenstiel, has made available to the Medical School of Northwestern University a grant for research on penicillin to include the production of the product and its application in cases of disease. A special committee has been established to control this research. Its members include Chester J. Farmer, *chairman,* Dr. Alexander A. Day, Dr. Sumner L. Koch, Dr. Walter S. Priest, Dr. Henry B. Bull, Dr. Guy P. Youmans and Samuel E. Thomason.

DR. DONALD G. MARQUIS has been appointed director of the Office of Psychological Personnel, 2101 Constitution Avenue, Washington 25, D. C., to succeed Dr. Steuart Henderson Britt, who has been commissioned in the Navy. Mrs. Jane D. Morgan has been appointed assistant to the director.

The Experiment Station Record reports that Dr. C. O. Brannen has been appointed director of the Agricultural Experiment Station of the University of Arkansas, as of July 1, and also director of the university bureau of research, set up for the purpose of coordinating all research work in the university. The former director, Dr. W. R. Horlacher, will continue as dean of the College of Agriculture and director of extension.

RESEARCH work at the Florida Agricultural Experiment Station will be materially increased by the recent appointment of three additional staff members as follows: Dr. Cyril L. Comar, formerly research assistant in chemistry at the Michigan State College, has been appointed associate biochemist, to conduct research in animal nutrition; Dr. Henry C. Harris, agronomist with the Delaware Agricultural Experiment Station, has been appointed associate agronomist, to conduct experimental work on pasture grasses, and Dr. Roger W. Bledsoe has been appointed associate agronomist for farm crops research. In addition, Dr. E. M. Andersen, assistant horticulturist, Sub-Tropical Experiment Station, Homestead, has been transferred to the Watermelon and Grape Investigations Laboratory, Leesburg, as associate horticulturist in charge, in the absence of Dr. M. N. Walker, plant pathologist on special work with the Bureau of Plant Industry.

AARON ARNOLD has been appointed head of the Nutritional Laboratory of the Winthrop Chemical Company at Rensselaer, N. Y.

DR. L. F. YNTEMA, professor of chemistry at St. Louis University, since 1930 head of the department of chemistry, has resigned to accept a research position with Fansteel Metallurgical Corporation, North Chicago.

DR. CHARLES S. VENABLE, who has been in charge of the viscose chemical research laboratory of the American Viscose Corporation, has been appointed director of chemical research. F. William Koster, in charge of acetate rayon and vinyon research at the Meadville, Pa., plant of the corporation, has been appointed assistant director, and will be transferred to the plant at Marcus Hook, Pa.

DR. EMMETT R. DUNN, curator of reptiles of the Philadelphia Academy of Natural Sciences, is serving in South America under the Committee for Inter-American Artistic and Intellectual Relations. He has been assigned to the Institute of Natural Sciences,

National University, Bogota, Colombia, where he will work on the collections of reptiles and amphibians from the eastern slope of the Andes. He will also collect specimens in the field.

A POSTGRADUATE Assembly on Nutrition in Wartime will be held by the Institute of Medicine of Chicago on Wednesday and Thursday, November 17 and 18. It will be devoted to phases of nutrition that are of particular interest at this time to practicing physicians, dentists, nutritionists and dietitians. There will be no fees of any kind and all members of these professions in Chicago and the Midwest are invited to register. The assembly will present five addresses on each of two mornings and on one afternoon; six panel discussions on the afternoon of the second day, and a "Nutrition Information, Please" program on the first evening. The First William Hamlin Wilder Memorial Lecture will be given on the evening of the second day by Dr. Russell M. Wilder, chief of the Civilian Food Requirements Branch, War Food Administration, Washington.

A BILL signed by the Governor of Alabama appropriates, to establish the Medical College of Alabama, a million dollars for land, buildings and equipment and $366,760 for each of the fiscal years ending September 30, 1944, and September 30, 1945. A building commission to select a site for the school, which will be conducted as a part of the University of Alabama, will be appointed. The bill authorizes the board of trustees of the university to establish a scholarship for each county in the state in the amount of $400 a year for the benefit of one resident of each county, payable from the annual state appropriation to the School of Medicine.

DRAKE UNIVERSITY, Des Moines, has announced receipt of a gift of $200,000 to build and equip after the war a new science building to be known as "Harvey Ingham Science Hall." The building is the gift of the Gardner Cowles Foundation, and the equipment will be given by the Register and Tribune Corporation. Mr. Ingham, in whose honor the new science hall is to be named, became editor emeritus of the Register and Tribune newspapers last January after serving as editor for forty years. The present Science Hall houses (with the exception of physics and astronomy) the science departments of the university and the College of Pharmacy.

THE Research Laboratory of the General Electric Company, Schenectady, N. Y., announces that 100,000,000-volt x-rays were produced on August 21 for the first time in the history of science. They were obtained from the large induction electron accelerator recently completed. The characteristics of this new type of radiation will be published as fast as they can be determined. The first few observations suffice to show, it is said, that these characteristics differ radically from those with which physicists are familiar.

THE Connecticut Agricultural Experiment Station at New Haven will hold an "Open House" on the station grounds on September 8. Departing from its traditional Field Day at the Mount Carmel farm, the station is this year setting aside half a day for the public to visit the station proper with its four laboratory buildings and six acres of ground. Open house will begin at 1:30 P.M. with a brief welcome by Director William L. Slate and a talk on "Plants and People" by Montague Free, horticulturist of the Brooklyn Botanic Garden. Following the program, visitors will have an opportunity to see the laboratories and greenhouses at work. Staff members will be on hand to explain the work in progress and answer questions on farm and garden subjects. Picnic tables and coffee will be available for early arrivals who bring box lunches. Because of the war limitation, no food will be served. To help to satisfy interest in home vegetable gardening, the "Victory Garden Clinic" will be provided. To the clinic, amateurs are invited to bring problems on soil, diseases and insect pests and any other phases of vegetable or flower gardening. The field work of the staff will be illustrated by moving pictures of forestry and mosquito control and by kodachrome slides of the Mount Carmel experimental grounds and the Tobacco Substation at Windsor. A number of exhibits, including the wood-burning unit for household furnaces, Japanese beetle control and the development of hybrid corn and squash, will be on view.

DISCUSSION

PREVENTION OF ORAL LESIONS IN B_1 AVITAMINOTIC DOGS[1]

IN the course of studies on shock induced by hemorrhage,[2] we have had occasion to produce avitaminosis B_1 in dogs. This has been done in two ways: first by the feeding of the diet suggested by Goodsell[3] which contains casein, sucrose, cottonseed oil, agar and cod liver oil, with autoclaved brewer's yeast to supply the other B complex vitamins, and second, by supplying the diet of Schaefer, McKibbin and Elvehjem,[4] in which, instead of brewer's yeast, the dogs were given

[1] The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and Vanderbilt University.

[2] W. M. Govier, *Jour. Pharmac. and Exper. Therap.*, 77: 40, 1943.

[3] J. Goodsell, *Am. Jour. Physiol.*, 134: 119, 1941.

[4] A. E. Schaefer, J. M. McKibbin and C. A. Elvehjem, *Jour. Biol. Chem.*, 144: 679, 1942.

riboflavin, nicotinic acid, pantothenic acid, pyridoxine and choline, in adequate amounts by stomach tube twice weekly. Many of the animals in both groups developed necrotic erosions beginning around the teeth and sometimes becoming so severe as to extend almost entirely around the lower jaw. Most of these lesions showed a thin mucopurulent discharge and a mildly fetid odor. We had supposed that these lesions, when they occurred in animals on the diet of Goodsell, were produced by the failure of the animals to eat the B complex vitamins contained in the autoclaved yeast, since it is well known that B_1 avitaminotic animals have little appetite. However, when, with the diet of Schaefer *et al.*, B complex vitamins were supplied by stomach tube, the lesions still occurred.

Although dogs normally synthesize their own vitamin C, the work of Sure *et al.*[5] suggested to us that perhaps, under the experimental conditions named above, they were unable to do so. These workers showed that various members of the vitamin B complex, including thiamin, were necessary for synthesis of vitamin C in the rat, another animal normally synthesizing its own ascorbic acid.

On this basis all the dogs were given 10 mg of ascorbic acid twice weekly with the other vitamins by stomach tube. Those animals showing the oral lesions promptly healed, and no more lesions appeared in the other dogs.

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THE GROWTH OF AN ICE SHEET

A REVIEW

IN a convocation address at Chicago Professor Flint announced a new theory of the growth of the ice sheet that had spread itself over most of North America that lies to the north of the Ohio and Missouri rivers.

This theory has now been published *in extenso* in both of the two most authoritative geological journals,[1] and, four months later, in the most authoritative and widely circulated journal of geography.[2] It is thus to have a publicity altogether exceptional for a technical discussion.

After picturing the development of an ice sheet from mountain glaciers in the highlands of Labrador, Flint proceeds to explain the manner of its expansion until its western boundaries had reached to what is now Wisconsin and Illinois. This had been brought about, claims Flint, by a process which is simplicity itself. The migrating low pressure areas of the atmosphere (cyclones) were presumably then as now charged with moisture and moving in an east northeasterly direction. They arrived at the western margin of the ice sheet where with the greatest of ease they advanced over the glacier to drop their moisture as snow a good part of the way in to the boss of the central ice dome. By processes generally understood for mountain glaciers this snow was transformed into glacier ice and by internal glacier flow it expanded the glacier boundaries westward and southward into the mid-Mississippi valley.

This theory thus takes full account of the studies of mountain glaciers made in the Alps by Agassiz during the early 1840's, but it ignores completely what has since been learned, particularly during the last quarter century, from studies of the existing continental glaciers of Greenland and the Antarctic.

The glacial anticyclone, a system of fierce outward-blowing storm winds which is fixed in position over a continental glacier, renders the cyclones powerless to invade it save in a waning stage of glaciation. The glacial anticyclone is nowhere discussed in Flint's theory and the extensive literature of the subject is not included in his three-page bibliography.

Those who read the exposition of Flint's amazing theory should be advised that studies made in Greenland by the German and American expeditions during the last decade have traced the paths of the cyclones which approach the glacier. These studies have shown that the cyclones are powerless to advance over the glacier more than a few tens of miles, and then only during the brief summer season and in south Greenland alone. As the cyclones approach the glacier they are shunted northward along its border and pass up Davis Strait and Baffin Bay. Where they impinge upon the glacier they deposit their moisture, not as snow to nourish it, but as rain to bring about its wastage. In fact, it now appears that this is the principal way in which the dissolution of an ice sheet is accomplished.

Of course during an advancing hemicycle of glaciation when ice sheets were growing, the vigor of the glacial anticyclone must have been much greater and cyclones, instead of being shunted away along the glacier margin, must have been repelled farther out during the near approach. This is the period to which Flint's theory applies.

WM. H. HOBBS
ANN ARBOR, MICHIGAN

[5] B. Sure, R. M. Theis and R. T. Harrelson, *Jour. Biol. Chem.*, 129: 245, 1939.

[1] Richard Foster Flint, "Progress and Problems in the North American Pleistocene," *Journal of Geology*, 50: 575–578, Aug.–Sept., 1942. "Growth of North American Ice Sheet during the Wisconsin Age," *Bulletin of the Geological Society of America*, 54: 325–362, March 1, 1943. 1 plate, 5 figures, 3 pages of bibliography.

[2] Richard Foster Flint, *The Geographical Review*, 33: 3, 479–481, July, 1943.

CURTAILMENT OF MILITARY PSYCHOLOGY IN GERMANY

IN its October 15, 1942, issue, which was only recently received in this country, the Swiss medical review *Praxis* reports the following: "The psychological testing service of the German armed forces has been quite considerably curtailed during the course of this year [that is after the first Russian winter], first in the air force (*Luftwaffe*), then in the army. Up to this time the service was charged with essential tasks of aptitude testing for the selection for special branches of the armed forces and for purposes of promotion."[1]

This report of a sharp curtailment of German military psychology comes as a surprise in view of the knowledge of the importance that it had gained at one time.[2,3] Before the war, 200 military psychologists were working in many testing stations all over Germany.

While the reasons for the curtailment are not given, two explanations suggest themselves: (1) the results of German military psychology were unsatisfactory; (2) its procedures proved themselves impractical under wartime conditions.

It does not seem likely that the first explanation should be correct. German military psychology, which was first installed during the first World War for the selection of automobile drivers, was resumed in 1926 and had since then undergone a steady orderly growth up to the present war. This period of 13 years should have given ample opportunity to test the intrinsic value of the testing service, and if continuous expansion was considered warranted, one must conclude that the results were satisfactory.

As to the second explanation, there seems to be some evidence that it is probably the right one. It is the purpose of this note to discuss that evidence.

German military psychologists were not satisfied with the method of standardized group tests as the basic procedure. They wanted to learn more about the testee than his numerical score on a test. What they wanted was a true character portrait of the testee. This was accomplished by the clinical approach. A testee was studied by a group of psychologists, usually six, for two entire days and in many, partly very realistic, test situations. The psychologists' ratings of the testee in these situations were checked with one another, and from the consensus of the ratings a report about the testee was prepared.

While the method was good, it was very time-consuming and required a relatively large staff of highly trained psychological personnel. Before the war only 100,000 men a year could be handled in this way. The selection procedure was always limited to officer candidates, pilots and specialists. The German military psychologists had been aware of the cumbersomeness of their method. In 1940, for example, a new test item was suggested to replace two previous items of the total procedure. The new item would reduce the amount of necessary testing equipment and represent a considerable saving in time. Whereas the old items required 11½ hours of the psychologists' time for the testing and appraising of 16 men, the new item would reduce this requirement to 5 hours.[4]

Eight months after the invasion of Poland, in May, 1940, a shortage of military psychologists in Germany was reported.[5] Particularly in the air force (*Luftwaffe*) an extraordinary demand for psychologists was anticipated in the near future. It seems that it was difficult to meet this demand, because the following year the training of applied (military) psychologists was expanded. In April, 1941, a new academic degree in psychology, *Diplom-Psychologe,* was created. This degree for applied psychologists has lower requirements than the Ph.D. in psychology, up to that time the only German degree in psychology and one of the qualifications for the military psychologist. The announcement of the new degree in the Spanish journal where we saw it began as follows: "Needs of the state, the Army, and business with regard to psychology have demanded in Germany a broader basis for the training of professional psychologists."[6]

In the light of the recent report of curtailment, it would appear that attempts to procure an adequate number of military psychologists failed. This failure —probably largely due to the high training requirements of the method, the new degree notwithstanding —together with the cumbersomeness of the method, is likely to have led to the final decision of drastic curtailment. If the psychological testing service could not be geared to real wartime demands, curtailment was the only alternative since military procedures must be uniform. It is worth noting that the earlier reported shortage of personnel was greatest among *Luftwaffe* psychologists and that it was subsequently the *Luftwaffe* where psychology was first curtailed.

German military psychology considered the clinical approach as basic. American military psychology, resumed from the first World War in 1940, considered the clinical approach as impractical for a program of Army dimensions and concentrated on standardized tests, although the tests "are always used in conjunction with ratings made by trained interviewers, commanding officers under whom the man is serving, or, in the case of officer candidates, special boards of

[1] Anon. *Praxis,* 31, 796, 1942.
[2] H. L. Ansbacher, *Psychol. Bull.,* 38, 370–392, 1941.
[3] L. Farago and L. F. Gittler, Editors. "German Psychological Warfare: Survey and Bibliography." New York: Committee for National Morale, 1941. Pp. 155.
[4] E. Läpple, *Zeits. angew. Psychol.,* 60, 1–63, 1940.
[5] M. Simoneit, *Soldatentum,* May, 1940.
[6] Anon. The title of "Diplome Psychologist" in Germany. *Psicotecnia,* 2, 218, 1941.

selection."[7] The curtailment of Germany military psychology in the emergency seems to support the judgment of the American military psychologists.

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TRANSLITERATION OF ENGLISH NAMES IN RUSSIAN

IF the transliteration of Russian names into English is a mess, that of English (and other) names into Russian is doubly so. The Russian alphabet, with all other Slavic alphabets except the Polish, has no *w*, which is of little consequence, its place being taken by *v* (as it is, more or less, in the pronunciation of many English words); but for some strange reason the Russians in general do not transliterate the *w* in English names by *v* (though they do so in various German words), but by *u*. Thus Wendell Willkie is "Uendel Uilki," New York is "Niu Iork," Shaw is "Šo," etc. But this is not all. For some unknown reason the Russian, alone among the Slavic and other European languages, has no *h*, though the sound is present in the Ukrainian and other Russian dialects. Thus Houston, for instance, would be given as "Giustn," Ohio as "Ogio," Hall as "Gol," etc. There is also no *th*, it being replaced by *f*, so that Thomas is "Foma," etc. An effort furthermore is to write foreign names phonetically, which involves further corruptions.

It is plain that to science all this will be of serious and growing disadvantage, as it must be of much impediment to foreigners learning Russian, as well as to Russian youth who learn foreign languages.

The remedy, at least for scientific publications and catalogues, would seem to be fairly simple—the printing by the Russians of all foreign names as they are and in italics; and the general adoption of the letter *h*. The all-powerful Academy of Sciences of the U. S. S. R. could readily effect these changes and they would be very much to its credit.

The Russian alphabet, as is well known, was taken, with orthodox Christianity, from Byzantium, and is essentially the Greek (Ionian) alphabet; but the Greek had both the sound of *h* and its alphabetic representation. The Greek too had (and has) a special letter for *th*.

ALEŠ HRDLIČKA

SMITHSONIAN INSTITUTION

ARTHUR WILLIS GOODSPEED

IN his excellent obituary of Arthur Willis Goodspeed,[1] Horace C. Richards pays tribute to Goodspeed's important pioneer work with x-rays. It is noteworthy that Goodspeed's profound interest in the physical properties of x-rays and in their practical applications was probably due to the fact that he *almost* discovered the phenomenon himself six years before Röntgen. This incident is described in my biography of Wilhelm Conrad Röntgen,[2] from which I quote:

> Goodspeed and a friend by the name of W. N. Jennings were photographing electric sparks and brush discharges on the evening of February 22, 1890. After some such experiments had been completed, the table was still littered with loaded plate holders and other apparatus when Goodspeed brought out some Crookes tubes and demonstrated them to Jennings. The next day, Jennings reported that when the plates were developed he had found a very curious phenomenon: two round discs superimposed upon the spark tracings on the photographic negative. No one could explain this curious effect, and the plates were put aside with other freak photographs and were forgotten. Six years later, after the discovery of the roentgen rays had been announced, these negatives were unearthed and reexamined. Another exposure was made with the same apparatus and under similar conditions, and the results were the same; that is, two discs with a sharp boundary on one side and a blurred boundary on the other side were visible on the plate. Goodspeed concluded a lecture on roentgen rays at the University of Pennsylvania on February 22, 1896, with the story of his early experiments, and said: "We can claim no merit for the discovery, for no discovery was made. All we ask is that you remember, gentlemen, that six years ago, day for day, the first picture in the world by cathodic rays was taken in the Physical Laboratory of the University of Pennsylvania."

Before publishing this account an inquiry in regard to the authenticity of the reports of this event brought from Goodspeed the following answer:

> PHILADELPHIA, February 15, 1929
>
> . . . The accidental roentgen effect which W. N. Jennings and I produced in 1890 was real and authentic. Because of our laxity in not following the matter up we do not claim any credit whatsoever, but the facts are as stated in such articles as you may have read.

CLEVELAND CLINIC FOUNDATION OTTO GLASSER

QUOTATION

POOLING RESEARCH

SIR JOHN ANDERSON'S visit to Washington and Ottawa marks further progress in a movement which began long before the United States entered the war and which has already yielded fruitful results. The immediate object is to set up a committee of scientists to act as a clearing house for information on scientific research. The committee would be formed, to begin with, by the Governments of Great Britain, the United States and Canada; but it is hoped that in due course the participation of other Governments will be secured

[7] The Staff, Personnel Research Section, Classification and Replacement Branch, The Adjutant General's Office, SCIENCE, 97, 473-478, 1943.

[1] SCIENCE, 98: 125, August 6, 1943.

[2] Springfield, Ill., Charles C Thomas, 1934.

and that the committee's work will be extended to deal with the needs of peace as well as with those of war. So far as the Governments are concerned the interchange of information has been as complete as the cooperation in the field. Even at a time when it seemed unlikely that the United States would participate in the actual fighting, the information acquired by the British forces and tested by experience in war was freely communicated to the American authorities and proved invaluable when the United States became an active ally. As the event showed, British science, in aviation, in the use of radio, in the manufacture of explosives and in many other matters, was well ahead of German, although for long years all the efforts of German scientists, like those of every other profession in Germany, had been concentrated on preparation for war.

This mutual Anglo-American aid has not been confined to Government agencies. In 1940, at the invitation of President Roosevelt, a British scientific mission under Sir Henry Tizard visited the United States and discussed ways and means of sharing scientific and technical information, and active cooperation was established with American men of science. Canada also took a hand, and Professor R. H. Fowler, then working with the National Research Council of Canada, helped to bring Canadian science into the tripartite arrangement. In the spring of 1941 Dr. Conant, the eminent chemist who is president of Harvard University, visited this country to promote the closest possible collaboration between the National Defense Research Association of the United States and the corresponding organizations in Great Britain. Since America came into the war, this intercourse and interchange has become even more intimate. By an agreement of January 1, 1942, each Government undertook at its own cost to obtain from its nationals such information and manufacturing rights as the other Government may require. These arrangements will be facilitated if, as the result of Sir John Anderson's mission, a regular clearing house is established to enable scientists in each country to keep in close touch with what is being done in the others. Such a clearing house, especially when it is extended to embrace the other countries which play a leading part in discovery and invention, will obviously be no less useful in peace than in war.—*The Times*, London, August 11.

SCIENTIFIC BOOKS

GASES AND VAPORS

The Adsorption of Gases and Vapors. Volume I. *Physical Adsorption.* By STEPHEN BRUNAUER. 511 pp. Princeton, N. J.: Princeton University Press. $7.50.

IN the preface to this volume the author states that he had considered two methods of treating his subject. By the first method he would marshall the observations and data gathered by the hundreds of investigators who have studied the adsorptive properties of charcoal, silica gel, metals, oxides and the many other important adsorbents. By the second method he would survey and discuss the attempts that had been made to analyze these observations and data in order to elucidate the nature of the adsorption process. He finally chose the second method, but he adds:

> Had I started the writing of this book a year later, I would doubtless have adopted the more practical approach because of its more direct relation to the needs of the war industry, but on the day of Pearl Harbor the greater part of this book was already written. As it is, it may prove to be useful in the training of scientists and technicians in colleges. Besides, a good practical chemist knows how to put science to use, and so perhaps this book will also find its way eventually into the stream of the industrial production of our nation.

The reader, in spite of Pearl Harbor, will, I think, be glad that the author chose the second alternative. In McBain's "The Sorption of Gases and Vapours by Solids" we already have a lively and stimulating treatment of adsorption from the phenomenological point of view; although a second edition of this eleven-year-old book is now long overdue and much to be desired. On the other hand, there is no up-to-date, thoroughgoing treatise on the theories of adsorption, and this Dr. Brunauer has now provided.

The author has further delimited his field by discussing only *physical* adsorption in this volume, except for the introductory chapters; he expresses the hope that some day he may write a second volume on chemical adsorption, but remarks that this

> . . . must wait until the end of the war. *Inter arma silent musae.* The writing of such a book is a long and time consuming process incompatible with present urgent work connected with the war. There is not much point in writing science, unless we make the world first safe for science.

A brief outline of the contents is as follows:

The introductory chapters present a selection of the important data on adsorption and a discussion of the experimental methods by which these data have been obtained. There follow three scholarly chapters on the various theories of adsorption, the derivation from them of equations for the adsorption isotherm, and the success of these equations in the representation of the observed data. Then come two chapters on the heat of adsorption and two on the surface of the

adsorbent. Finally, there is a chapter each on the pore structure of the adsorbent, on the kinetics of adsorption and on mixed adsorption.

The treatment is thorough, up-to-date and discriminating. It is neither tiresome nor encyclopedic, as is so often the case in general treatises of this kind. Only such mathematics is included as is necessary to understand the course of the argument. Best of all, the author does not hesitate to point out the merits or demerits of the theoretical conclusions which he develops, but his comments are restrained and judicial. His style is clear, simple and direct.

The book can be recommended to any one who wishes a broad and thorough survey of our present understanding of the nature of physical adsorption; he will find it both competent and stimulating.

ARTHUR B. LAMB

TISSUE CULTURE

A Handbook of Plant Tissue Culture. By PHILIP R. WHITE. Pp. xiv + 277. Lancaster: The Jaques Cattell Press. 71 figs. 1943. $3.75.

INTEREST in plant tissue culture has been increasing rapidly in recent years. It is significant that we have now advanced to the point where a good handbook on the subject is a necessity. Fortunately a skilled technician in this field has provided an excellent book covering the tissue culture technique briefly but thoroughly. Seldom does one find a complicated subject handled so fully and so succinctly.

Dr. White presents the subject in ten chapters, the first of which by way of introduction stresses the importance of morphogenesis, out of the study of which tissue culture has arisen. He points out clearly the advantages of the tissue culture approach to the problems of the origin of form and function in organized beings.

The second chapter sketches the history of plant tissue culture, in four periods of development. The entire history covers a little more than a century, but most of the progress has been made since 1930. This progress hinged upon the successful development of culture media suitable for the unlimited growth of excised root tips. A fine feature of the historical account is the inclusion of portraits of the major investigators in this field.

The third chapter discusses the material which may be used successfully in tissue cultures, mainly those which are meristematic in character, such as apical meristems, cambial tissues and embryos.

Recognizing the importance of facilities for work, the author devotes the fourth chapter to a detailed description of the kind of laboratory which should be available for such investigations. A detailed floor-plan is given, showing a convenient arrangement for laboratory room, transfer room, media room, culture room and office. Even the equipment most useful to the work is detailed, with suggestions and directions for successful manipulation of all equipment.

Several succeeding chapters describe the methods and materials for making synthetic nutrient media—the methods by which cultures may be started; the culture techniques; and the methods of making measurements and recording them for later interpretation. These chapters are all written with the utmost clarity.

The last two chapters turn to the significance of plant tissue culture in the solution of biological problems. These are very stimulative, and will no doubt encourage much more work to be undertaken. Chapter nine, for instance, discusses the relation of tissue culture to the problems of pathology and general physiology; and chapter ten returns to the primary issue, morphogenesis. A bibliography of 457 citations covers collateral fields, as well as plant tissue culture. The work closes with an adequate index.

The book has been admirably planned, and the subject has been handled very skilfully. It is fortunate indeed that the first handbook in this field has been so well done. It should serve for many years as a sufficient guide to students and older investigators interested in tissue cultures. Because of its broad point of view it should find a place in every physiologist's private library.

CHARLES A. SHULL

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ESSAYS IN BIOLOGY

Essays in Biology. In Honor of Herbert M. Evans. Written by his friends. 687 pp. Berkeley and Los Angeles: University of California Press. 1943. $10.

FORTY-EIGHT papers on apparatus, endocrinology, the history of biology, nutrition, physiology, cytology, medicine, growth and experimental biology, together with a complete biography of Evans, are found in this memorial volume. It is issued in commemoration of his sixtieth birthday. Ten of the titles are upon the history of biology, including one by George W. Bartelmez, a translation, with notes, of Purkinje's paper on the "History of the Bird's Egg Previous to Incubation," another by George W. Corner of de Graff's article "On the Female Testes or Ovaries." In addition there are the following titles: "Kidney—Explantation in Relation to Arterial Tension" (8 pp.), Frederick M. Allen; "The Influence of the Endocrine Organs on Intestinal Absorption" (11 pp.), T. L. Althausen; "The Impact of the Introduction of Iron on Medical and Religious Thought" (6 pp.), Walter C. Alvarez; "The Physiology of the Salt-treated Adrenalectomized Animal" (15 pp.), Evelyn Ander-

son, in which the author concludes that "All these data strongly suggest that the adrenal cortical hormone acts on the mechanisms of the body which require salt"; "The Localization of Lipids in Cytoplasm" (7 pp.), R. R. Bensley; "The Source of Equine Gonadotrophin" (13 pp.), H. H. Cole and Harold Goss; "The Biological Standardization of the Vitamins" (7 pp.), Katharine H. Coward; "The Prevention of Deafness" (5 pp.), S. J. Crowe; "Gene *H* and Testosterone in the Fowl" (9 pp.), C. H. Danforth, in which we discover that "thus far we seem to have gotten no inkling as to the underlying basis for sexual differences in plumage . . . the whole situation may be altered fundamentally by a simple cytological change is apparent in the effects produced by the gene *H*"; "The Influence of Hormones on the Sexual Behavior of Domestic Fowl" (11 pp.), David E. Davis and L. V. Domm; "Pituitary Gonadotrophins" (7 pp.), Heinz L. Frankel-Conrat, Choh Hao Li and Miriam E. Simpson; "Estrogen Assay in the Human" (5 pp.), S. C. Freed; "Functional Interrelation of Cerebral Cortex with Basal Ganglia and Cerebellum" (10 pp.), John F. Fulton; "The Solubility of Proteins and Their Separation from Mixtures with Special Reference to Serum" (11 pp.), Arda Alden Green; "Gonadotrophic Stimulation of the Ovaries of the Adult Rhesus Monkey" (6 pp.), Carl G. Hartman; "The Pathological Clinical and Biochemical Correlation of Tumors of the Testis" (8 pp.), Frank Hinman; "The History of Hypophysial Diabetes" (10 pp.), B. A. Houssay; "The Symballophone: A Double Stethoscope for the Comparison and Laterialization of Sound" (16 pp.), Wm. J. Kerr; "On the Significance of the Forgotten Thermodynamic Theorems of Cärnot" (18 pp.), F. O. Koenig; "John Banister and the Pulmonary Circulation" (6 pp.), Stanford V. Larkey and Owsei Temkin; "Comparison of the Conditions under which Estrogens and Carcinogenic Hydrocarbons are Tumorigenic" (19 pp.), Alexander Lipschütz; "Lobulo-alveolar Mammary Growth Induced in Hypophysectomized Rats by Injections of Ovarian and Hypophyseal Hormones" (13 pp.), Wm. R. Lyons; "Pulmonic Interstitial Emphysema and its Sequelae: an Anatomical Interpretation" (32 pp.), Charles C. Macklin and Madge T. Macklin; "Charles Edward Brown-Séquard" (7 pp.), Ralph H. Major; "The Undischarged Ovarian Follicle" (5 pp.), F. H. A. Marshall; "Mechanism of the Descent of the Testicle under the Action of Sex Hormones" (9 pp.), Thales Martins; "A Hemorrhagic State in the Vitamin E-Deficient Fetus of the Rat" (9 pp.), Karl E. Mason; "Relationships of Sodium and Potassium to Carbohydrate Metabolism" (14 pp.), Irvine McQuarrie; "Harvey's Ideas of Embryonic Nutrition" (8 pp.), A. W. Meyer; "Observations on the Pathogenesis of Undulant Fever" (21 pp.), K. F. Meyer; "French Medical Education as a Legacy from the Revolution" (8 pp.), J. M. D. Olmsted; "Cytological Differences between Castration and Thyroidectomy Basophils in the Rat Hypophysis" (12 pp.), J. D. Reese, A. A. Koneff and P. Wainman; "Studies on the Growth of Lymph Nodes, Thymus, and Spleen in the Rat" (9 pp.), William O. Reinhardt; "The Self-Selection of Diets" (6 pp.), Curt P. Richter; "The Relationship of the Anterior Pituitary to the Thyroid and the Adrenal Cortex in the Control of Carbohydrate Metabolism" (19 pp.), Jane A. Russell; "Vesalius and Don Carlos; A Historical Footnote" (8 pp.), John B. deC. M. Saunders; "Impotence as a Result of Witchcraft" (6 pp.), Henry E. Sigerist; "The Coagulation of Blood: Quantitative Viewpoints" (4 pp.), H. P. Smith; "An Experimental Anatomical Study of Sensory Masking" (5 pp.), I. Maclaren Thompson; "The Effect of Progesterone and Lactogenic Hormone upon Prolongation of Pregnancy in the Lactating Mouse" (8 pp.), Kaisa Turpeinen; "Is Increased Capillary Fragility a Sign of Ascorbic Acid Subnutrition?" (8 pp.), Osmo Turpeinen; "The Experimental Production of Pseudohermaphroditism in the Monkey" (25 pp.), G. van Wagenen and James B. Hamilton. "An exogenous androgen can pass through the placenta to induce pseudohermaphroditism in the female young of the monkey." "The Heart in Myxedema" (18 pp.), James J. Waring; "Studies on the Growth of Antlers: II. Seasonal changes in the male reproductive tract of the Virginia deer (*Odocoileus virginianus borealis*); with a discussion of the factors controlling the antler-gonad periodicity" (23 pp.), George B. Wislocki. "Hence, unlike many other secondary sex characters, antler growth is not primarily dependent upon the gonads"; "Sex Differentiation in Heterogeneous Parabiotic Twins (Ambystoma × Triturus)" (19 pp.), Emil Witschi and Harriet M. M. McCurdy, "The growth of ovaries and testes is controlled by gonadal growth substances"; "Ovum, Cycle, and Menstruation" (7 pp.), Bernhard Zondek.

The shortest papers have but four pages; the longest thirty-two. An inspection reveals the fact that if these papers were grouped according to their subject-matter about one half would naturally appear together; the other half would be widely distributed. One may therefore question the advisability of putting out so diversified a group in a single book, admitting at the same time the fine personal tribute thus evidenced. However this may be, it is evident that the material that thus appears is, to a large extent, of such a character as to make quite a general appeal to medical biologists and others.

C. E. McCLUNG

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SPECIAL ARTICLES

THE EFFECT OF PROPAMIDINE ON BACTERIAL METABOLISM[1]

THE oxidative metabolism of bacteria is not affected by sulfanilamide or its derivatives in concentrations which effectively inhibit their growth. Recently it has been shown[2] that propamidine, a diamidine which is active against a number of protozoan infections, inhibits the growth of bacteria in wounds. It was therefore of interest to determine whether propamidine in concentrations which inhibit growth inhibits the oxidative metabolism of bacteria. *E. coli, Staphylococcus aureus* and *albus* were grown overnight in a medium containing 10 gms of peptone, 10 gms of glucose 3.0 gms of Armour's meat extract and 5 gms of NaCl per liter. The bacteria were centrifuged and washed with water and finally suspended in 0.05 M phosphate buffer pH 7.8. Aliquots were placed in Warburg vessels and the oxygen uptake measured in the presence of added substrates. In the absence of substrates the oxygen uptake was negligible. Nephelometric determinations before and after the experiment showed that no growth occurred during the time the bacteria were shaken in the vessels. This was true even in the presence of meat extract, the oxidation of which tends to proceed in an S-shaped curve. Table 1 illustrates an experiment with *E. coli,* which is typical also of the other bacteria tried.

This experiment shows that the oxidation of constituents of meat extract and peptone is much more sensitive to the drug than that of pyruvic acid or glucose. It is probable that the oxygen uptake in the presence of meat extract or peptone is caused by the oxidation of amino acids, for alanine and asparagine are similarly affected as shown both by the inhibition of the oxygen uptake and ammonia production. The oxidation of glucose and pyruvic acid can be inhibited effectively if the concentration of the drug is increased to M/8000. This concentration is still twenty times smaller than the 0.1 per cent. recommended for application to wounds. As indicated in Table 1, the oxidation of pyruvic acid is more sensitive to the drug than that of glucose. The figures in Table 1 also show that it takes a certain length of time before the inhibition reaches a maximum. This latent period may be attributable to the time necessary for the penetration or activation of the drug because if it is shaken with the bacteria for two hours before the addition of the substrates an immediate inhibition is obtained. At pH 6.7 the inhibition is much less effective than at pH 7.8. Thus at the end of three hours the oxidation of peptone at pH 6.7 is inhibited 29 per cent., at pH 7.8, 68 per cent. The effect of stilbamidine is similar to that of propamidine, except that higher concentrations are necessary to produce equivalent inhibitions.

The oxygen uptake of suspensions of rat kidney and liver is not inhibited by M/8000 propamidine. Addition of various substrates such as succinate, choline, xanthine, d-amino acid and tyramine shows that only the oxidation of the last is inhibited by the drug. The oxygen uptake of rat brain suspensions is, however, inhibited. This is due primarily to the fact that the oxidation of glucose is inhibited 50 per cent. by conceneration of M/30,000. It requires a concentration of M/15,000 to produce a similar effect on the oxidation of pyruvate.

TABLE 1

THE EFFECT OF M/80,000 PROPAMIDINE ON THE OXYGEN UPTAKE OF E. COLI IN THE PRESENCE OF 2.0 MG EACH OF VARIOUS SUBSTRATES, pH 7.8 37°

	Oxygen Uptake											
Time	Peptone			Meat Extract			Pyruvic Acid			Glucose		
	Control	Propamidine	Inhibition	Control	Propamidine	Inhibition	Control	Propamidine	Inhibition	Control	Propamidine	Inhibition
min.	*cmm*	*cmm*	*per cent.*	*cmm*	*cmm*	*per cent.*	*cmm*	*cmm*	*per cent.*	*cmm*	*cmm*	*per cent.*
30	16	16	0	9	9	0	28	27	0	93	98	0
60	29	22	24	22	15	32	73	66	10	191	197	0
90	46	26	44	46	24	48	127	115	10	253	269	0
150	84	32	62	141	45	68	198	178	10	322	345	0
210	121	36	70	219	80	64	222	200	10	380	397	0

The oxygen uptake of suspensions of rat brain is inhibited by M/80,000 propamidine. The oxidation of glucose is inhibited 50 per cent. by M/30,000 propamidine. The oxidation of pyruvate is inhibited 50 per cent. by M/15,000 propamidine. The oxidation of peptone is inhibited 50 per cent. by M/80,000 propamidine. The oxidation of meat extract is inhibited 50 per cent. by M/80,000 propamidine. The oxidation of pyruvic acid is inhibited 50 per cent. by M/80,000 propamidine. The oxidation of glucose is inhibited 50 per cent. by M/30,000 propamidine.

SUMMARY

M/80,000 propamidine inhibits the oxidation of the nitrogeneous constituents of the medium in which the bacteria grow. A certain latent period occurs before the inhibition reaches a maximum and the drug is more effective at pH 7.8 than at pH 6.7. As is shown in the accompanying article by Dr. Kohn, this concentration is in the minimal effective range for the inhibition of growth. A latent period and a similar pH effect also are present when growth is inhibited. It is thus possible to conclude that propamidine, unlike sulfanilamide and its derivatives, directly affects the oxidative metabolism of these bacteria.

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[1] Dr. D. F. Robertson of Merck and Company very kindly supplied the propamidine and stilbamidine.

[2] W. R. Thrower, F. C. O. Valentine, A. H. McIndoe, A. R. Tilley, G. H. Morley, J. P. Bentley, F. Kohn, M. H. Hall and C. D. Cross, *Lancet,* 144: 133–140, 1943.

THE EFFECT OF PROPAMIDINE ON BACTERIAL GROWTH[1]

THE aromatic diamidines, employed in the treatment of protozoal infections,[2,3] also possess antibacterial action.[4] Propamidine (4:4′-diamidino-diphenoxy propane), used locally in the treatment of wounds, was found[5] to inhibit bacterial growth in complex media and to be uninfluenced by *p*-aminobenzoic acid. These results have been confirmed and extended.

The tests were carried out at 37.7° C., using a standard size of inoculum diluted from an actively growing culture. Ten generations were necessary to produce the degree of turbidity, measured photoelectrically, taken as positive growth. In each trial a series of drug concentrations was tested in order to determine which inhibited the rate of growth by 50 per cent. (*i.e.*, doubled the time taken by the controls to reach the chosen turbidity). Complete inhibition could be obtained by doubling or tripling this concentration.

The effect of peptone was determined with a strain of *E. coli* which grows well in medium SG of inorganic salts and glucose.[6] As shown in Table 1, adding 1 per cent. proteose peptone number 3 (Difco) approximately tripled the required amount of propamidine, whereas in parallel experiments it was found to raise the required sulfathiazole concentration by more than 500 times. Medium PPFG[6] contained 2 per cent. peptone and 0.2 per cent. glucose, added after autoclaving. Changing its pH from 7.0 to 7.7 slightly increased the drug activity. *Staphylococcus aureus* was about as sensitive to the drug as *coli;* raising the pH from 7.0 to 7.7 increased the potency of the drug 3 to 4 times. Stilbamidine was definitely less effective than propamidine. Preliminary testing in urine showed propamidine to be active at less than 4 mg per cent.

TABLE 1

DIAMIDINE CONCENTRATIONS INHIBITING GROWTH BY 50 PER CENT. THE FIGURES IN BRACKETS INDICATE THE NUMBER OF TESTS AVERAGED

Organism	Medium	pH	Propamidine*		Stilbamidine	
			mg per cent.		*mg per cent.*	
E. coli						
	SG	7.2	0.32	(2)	0.60	(1)
	SG + 1 per cent. P	7.2	0.85	(2)	4.20	(1)
	PPFG	7.7	0.85	(2)	...	
	PPFG	7.0	1.10	(3)	...	
Staph. aureus						
	PPFG	7.7	0.43	(3)	12.60	(2)
	PPFG	7.0	1.52	(2)	12.60	(1)

* Dr. Bernheim frequently used M/80,000 or 0.53 mg per cent. to inhibit the respiration of *E. coli.*

In addition, Dr. F. Bernheim and Dr. C. Brindley found the growth of the tubercle bacillus strain H37 to be inhibited about 50 per cent. by 5 mg per cent. propamidine.

The small peptone effect in the case of propamidine suggests that the *in vitro* testing of the drug will be much less difficult than has been the case with the sulfonamides. Also, this fact suggests propamidine to act primarily upon catabolic rather than anabolic systems. This is consistent with Dr. Bernheim's finding that propamidine is a potent inhibitor of cellular oxidations, particularly those involving peptone or meat extracts. As with growth, respiration is inhibited more effectively at alkaline reaction.

Methylene blue has been tested for antagonism in growth experiments. It was without effect in the case of *coli.* In *aureus,* where it is inhibitory, it synergized with propamidine. Sulfathiazole showed synergism with propamidine in *coli* grown in medium SG. In both these cases of synergism, the expected inhibition was doubled.

In *aureus* the inhibition develops gradually during the first two or three divisions (50 to 70 minutes); in *coli* the drug acts more rapidly. In *aureus* the latent period is not shortened by preliminary incubation in medium with the drug at 5° C. for 150 minutes, or 37.7° in buffer with drug. However, incubation at 37.7° C. in buffer plus *glucose* and drug about doubled the inhibition when growth was subsequently initiated by the addition of peptone. This curious result contrasts with the sulfonamides[6] and suggests that the latent period may involve activation of the drug.

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[1] Aided by a grant from the Rockefeller Foundation. The drugs were kindly supplied by Merck and Company.

[2] H. King, E. M. Lourie and W. Yorke, *Ann. Trop. Med. and Parasitol.*, 32: 177, 1938.

[3] Numerous papers in *Ann. Trop. Med. and Parasitol.*, 1938–1943.

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THE NATURE OF MYASTHENIA GRAVIS[1]

MYASTHENIA GRAVIS is a slowly progressive but fatal fatiguability and weakness of muscles. Walker's observation[2] that prostigmine, a choline esterase inhibitor, aided patients with myasthenia gravis, suggested that the acetylcholine metabolism was disturbed in such patients. Assuming that this concept has validity, the dominant possibilities concerning myasthenia gravis are: (a) excessive destruction of acetylcholine due to unusually large amounts of choline esterase

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[2] *Proc. Roy. Soc. Med.*, 28: 759, 1935.

(demonstrated to be unlikely by Milhorat[3]); (b) defects in the ability of muscle to utilize acetylcholine (disproven by Lanari[4] and Harvey and collaborators[5,6]); and (c) defects in the synthesis of acetylcholine.

The most plausible hypothesis is that there exists a fundamental defect in the synthesis of acetylcholine in patients with myasthenia gravis. Dr. Otto Loewi suggested that such synthesis be investigated. We are immeasurably indebted to Dr. Loewi for his enthusiastic interest in the development of the problem and for his valuable advice on technique.

Method: The acetylcholine synthesis of mixtures containing standard amounts of frog brain and serum from control subjects was compared with the acetylcholine synthesis of mixtures of frog brain and of serum of patients with myasthenia gravis. Using a modified method of Quastel, Tennenbaum and Wheatley,[7] the mixtures were incubated for a standard period at a standard temperature and the acetylcholine content ascertained by means of the rectus abdominis muscle of frog (Riesser,[8] Chang and Gaddum[9]). The amount of acetylcholine synthesized during the incubation was calculated by subtracting from the content of each incubated sample the acetylcholine content of identical non-incubated samples.

Results: Mixtures containing serum and frog brain synthesized more acetylcholine than mixtures containing Ringer's solution and frog brain. Freshly prepared frog brain-serum mixtures contained 0.38 γ acetylcholine per 100 mg of tissue. As a result of incubation 1.45 γ acetylcholine was produced. In contrast the acetylcholine synthesized from the mixtures of frog brain and serum obtained from patients with advanced myasthenia gravis was approximately one third as much (0.53 γ). Six patients with myasthenia gravis have been compared with forty-eight control subjects.

At least some of the agents which modify acetylcholine synthesis are dialyzable.

Comment: The decrease of acetylcholine synthesis is apparently specific for myasthenia gravis, since it does not occur with other diseases presenting debility, cachexia, immobility and prostration. Also the magnitude of defect in acetylcholine synthesis is related to the severity of the myasthenia gravis.

Conclusion: The defect in acetylcholine synthesis in patients with myasthenia gravis probably explains the fatiguability and weakness of these patients.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

CORTICOTROPIN OBTAINED BY ULTRAFILTRATION OF PITUITARY EXTRACTS[1]

IT is generally believed that hypophyseal corticotropin is protein in nature, as are the other hormones of the anterior pituitary, and consequently non-dialyzable. Purification has been directed towards the isolation of a protein, and dialysis has been used as a means for removing impurities of smaller molecular size. However, the stability of certain of the anterior pituitary hormones when exposed to drastic chemical procedures suggests that they may be of small molecular size.

In recent experiments it was found that dialysates of hog pituitary extracts contained a factor which increased the size of the adrenals in hypophysectomized rats. The observation was first made with a dialysate of a glacial acetic acid extract[2] of acetone-dried hog pituitary powder. The material had dialyzed for a period of two weeks against an equal volume of water, and the dialysate was used directly for injection into immature hypophysectomized male rats. In subsequent experiments extracts were ultrafiltered through Cellophane membranes (Visking sausage casing) under the pressure of a water column of approximately six feet. The ultrafiltrates were perfectly clear and almost colorless. The active material was precipitated by adding solid sodium chloride to the ultrafiltrate at a pH 4.0 until a molarity of 4.5 was reached. The subsequent addition of ammonium sulfate to a molarity of 1.5 brought about further precipitation of active material from the supernatants of the ultrafiltrates previously nearly saturated with sodium chloride. The salt precipitates were dried with ether. Another effective procedure for obtaining the activity from the original ultrafiltrates was found in the freezing-drying technique.

The amount of active substance obtained was determined by assay[2] in hypophysectomized rats. The relation of dose to response followed the parabolic assay curve which was based on the activity of hog whole pituitary powder. As the ultrafiltrates showed a

[3] *Jour. Clin. Invest.*, 5: 649, 1938.
[4] *Rev. Soc. Arg. Biol.*, 13: 239, 1937.
[5] Harvey and Lilienthal, *Bull. Johns Hopkins Hosp.*, 69: 566, 1941.
[6] Harvey, Lilienthal and Talbot, *Jour. Clin. Invest.*, 21: 579, 1942.
[7] *Biochem. Jour.*, 30: 1668, 1937.
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[1] Under the auspices of the Committee on Pharmacotherapy, Harvard University. Supported by the National Research Council.

[2] Details of the extraction procedure and assay method will be published elsewhere.

biuret reaction, the intensity of which closely paralleled its hormonal activity, the amount of active substance was expressed in equivalents of protein as determined by photoelectric colorimetry. The amount of protein equivalents relative to the solids obtained by the above procedures and the activity in units, as defined, are given in Table 1. The yield of corticotropin obtained by ultrafiltration of a glacial acetic acid extract for six days, with change of the membrane every 24 hours, is expressed in Table 2 in percentage of the activity of the extract. Nearly half of the solids of the extract passed through the membrane and contained 38 per cent. of the total activity of the extract. The part remaining within the dialysis bag contained 28 per cent. of total activity. The powders obtained from the ultrafiltrates showed a better solubility in water than the original material or the residue after ultrafiltration. The solutions also contained less color. The biuret, Hopkins-Cole, Millon and Sakaguchi reactions were positive. A 0.1 per cent. solution of the material showed immediate precipitation upon addition of phosphotungstic or phosphomolybdic acid, but not with trichloracetic or picric acid. The activity was not destroyed by boiling the solution for ten minutes. The ultrafiltrates of glacial acetic acid extracts were free from gonadotropic and thyrotropic hormones.

TABLE 1

CORTICOTROPIN OBTAINED BY SALTING OUT OR BY FREEZING AND DRYING ULTRAFILTRATES OF EXTRACTS OF HOG PITUITARY

Number of animals	Material obtained from ultrafiltrates	Mgm. protein* equivalents per 1 gm of solids	Units† per 1 gm of protein equivalents	Units† per 1 gm of solids
8	(a) 4.5 M NaCl precipitate	484	120	58
5	(b) 1.5 M $(NH_4)_2SO_4$ precipitate from supernatant of (a)	255	102	26
9	(c) Total solids obtained by freezing and drying	286	125	36

* Amount equivalent to protein as measured photoelectrically by the biuret reaction.

† 1 unit is equivalent to the activity of 12 mgm of acetone-dried hog pituitary powder which elicits a 100 per cent. increase of the adrenal weight in the hypophysectomized rat over a five-day injection period.[2]

TABLE 2

YIELD OF CORTICOTROPIN OBTAINED BY FREEZING AND DRYING AFTER ULTRAFILTRATION FOR 6 DAYS OF A GLACIAL ACETIC ACID EXTRACT OF ACETONE-DRIED HOG PITUITARY POWDER. CHANGE OF THE MEMBRANE EVERY 24 HOURS

	Solids gm	Activity units	Percentage of total activity
Glacial acetic acid extract; 2 M NaCl precipitate	4.00*	205	100
Material obtained by ultrafiltration; frozen and dried	2.18	79	38
Residue after ultrafiltration; 2 M NaCl precipitate	2.69	58	28

* As calculated from the weight of the precipitate of one ninth of the extract.

The fact that a corticotropic substance passes through a Cellophane membrane indicates the probability that its molecular size is smaller than has been assumed. In order to determine whether the extraction with glacial acetic acid resulted in the splitting of an active group from a larger molecule or whether there were active groups of smaller molecular size in the original acetone-dried powder, the following experiments were performed. The acetone-dried powders of sheep and beef pituitaries were suspended in water and adjusted to pH 3.0 with hydrochloric acid. Suspensions of hog pituitary powder were similarly adjusted to pH 3.0 and to pH 9.0 and 10.0, respectively, with sodium hydroxide. Corticotropic activity was demonstrated in the ultrafiltrates of all five of these solutions, showing that the unextracted acetone-dried powder of the pituitary contained under those conditions a corticotropic substance of a relatively smaller molecular size.

Summary: A substance with corticotropic activity has been obtained by dialysis and by ultrafiltration of pituitary extracts.

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